

HIV and sex workers 6



HIV risk and preventive interventions in transgender women sex workers

Tonia Poteat, Andrea L Wirtz, Anita Radix, Annick Borquez, Alfonso Silva-Santisteban, Madeline B Deutsch, Sharful Islam Khan, Sam Winter, Don Operario

Worldwide, transgender women who engage in sex work have a disproportionate risk for HIV compared with natal male and female sex workers. We reviewed recent epidemiological research on HIV in transgender women and show that transgender women sex workers (TSW) face unique structural, interpersonal, and individual vulnerabilities that contribute to risk for HIV. Only six studies of evidence-based prevention interventions were identified, none of which focused exclusively on TSW. We developed a deterministic model based on findings related to HIV risks and interventions. The model examines HIV prevention approaches in TSW in two settings (Lima, Peru and San Francisco, CA, USA) to identify which interventions would probably achieve the UN goal of 50% reduction in HIV incidence in 10 years. A combination of interventions that achieves small changes in behaviour and low coverage of biomedical interventions was promising in both settings, suggesting that the expansion of prevention services in TSW would be highly effective. However, this expansion needs appropriate sustainable interventions to tackle the upstream drivers of HIV risk and successfully reach this population. Case studies of six countries show context-specific issues that should inform development and implementation of key interventions across heterogeneous settings. We summarise the evidence and knowledge gaps that affect the HIV epidemic in TSW, and propose a research agenda to improve HIV services and policies for this population.

Introduction

Emerging data show the disproportionate burden of HIV in transgender women and transgender women sex workers (TSW) compared with other populations.^{1–3} Worldwide, HIV prevalence is about 19·1% in transgender women, with an odds ratio of 48·8 (95% CI 21·2–76·3) compared with the general adult populations.¹ This prevalence is greater for TSW who have an estimated worldwide HIV prevalence of 27·3%.² Laboratory-confirmed HIV data for transgender women is available from only 15 countries (one in North America, six in Asia Pacific, five in Latin America, three in Europe), which emphasises the need for greater attention to the HIV-related requirements of transgender women and TSW. In view of these data, TSW have been identified by UNAIDS as a key population at risk for HIV within the worldwide epidemic response.⁴

The term transgender refers to a diverse population whose gender identity or expression differs from their assigned sex at birth.⁵ Language about and recognition of this population vary by geography, ethnic origin, and culture, and continue to change over time. Transgender people are culturally recognised with specific social roles in some countries; in others, they receive little public acknowledgment.^{6,7} A subset of terms used for this population is presented in the appendix (p 1).

TSW have been reported in every continent, often in urban HIV epicentres. However, TSW and their partners and clients, have been largely absent from HIV national surveillance and programme interventions. Invisibility of TSW could be due to misclassification as men who have sex with men (MSM) or natal female sex workers, or

attributable to systematic neglect. Sampling, methodological, and theoretical limitations in studies of TSW further undermine an effective public health response to the needs of this population.

The proportion of transgender women who sell sex is uncertain, because estimates are limited by non-probability sampling methods and different definitions of sex work. A US-based meta-analysis of HIV in transgender populations estimated that 24–75%

Key messages

- Transgender women sex workers (TSW) face disproportionate risk for HIV, but have received little attention in the published literature
- TSW have a unique combination of risk factors, including biological (eg, illicit hormone and silicone injection), individual (eg, need for gender affirmation), interpersonal (eg, high-risk male partners), and structural (eg, systemic discrimination and violence based on gender expression, perceived sexuality, and occupation)
- HIV research on TSW in Africa, eastern Europe, and central Asia is urgently needed
- Evidence-based HIV prevention, care, and treatment interventions for TSW are urgently needed (eg, transgender-affirming HIV educational material, and integration of gender care into HIV care)
- Substantial reductions in the number of new infections could be accomplished with small changes in risk factors in this population by combination prevention approaches tailored to the setting

Published Online

July 22, 2014
[http://dx.doi.org/10.1016/S0140-6736\(14\)60833-3](http://dx.doi.org/10.1016/S0140-6736(14)60833-3)

This is the sixth in a **Series** of seven papers about HIV and sex workers

For a **Lancet HIV and sex workers Series** infographic see <http://www.thelancet.com/series/HIV-and-sex-workers/infographic>

Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA (T Poteat PhD); Johns Hopkins Medical Institute, Baltimore, MD, USA (A L Wirtz MHS); Callen Lorde Community Health Center, New York, NY, USA (A Radix MD); The HIV Modelling Consortium, Department of Infectious Disease Epidemiology, Imperial College London, London, UK (A Borquez PhD); Unit of Health, Sexuality and Human Development, Universidad Peruana Cayetano Heredia, Lima, Peru (A Silva-Santisteban MD); Center of Excellence for Transgender Health, Department of Family and Community Medicine, University of California—San Francisco, San Francisco, CA, USA (M B Deutsch MD); The Global Fund Project, Center for HIV and AIDS, icddr, Dhaka, Bangladesh (S Islam Khan PhD); Division of Policy and Social Studies in Education, Faculty of Education, University of Hong Kong, Hong Kong, China (S Winter PhD); and School of Public Health, Brown University, Department of Behavioral and Social Sciences, Providence, RI, USA (D Operario PhD)

Correspondence to: Dr Tonia Poteat, Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA
tpoteat@jhsph.edu

Search strategy and selection criteria

For the review of HIV risks we searched PubMed (MEDLINE), EBSCOhost, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) for English language articles. Additional sources included publicly available reports, health surveys, and needs assessments done in transgender communities by governmental and non-governmental organisations, including the US Department of State, the International Lesbian and Gay Association, the International Lesbian and Gay Human Rights Commission, and The UN Development Programme. Medical subject headings (MeSH) terms for transgender (including “transsexual”, “cross dresser”, “transvestite”, and “Travesti”) were cross-referenced with terms for sex work (including “sex workers”, “prostitution”); “HIV or AIDS”; “sexually transmitted diseases”; and “silicone or soft tissue fillers”. We searched for country reports in Google Scholar using “transgender” AND (country or region). This search engine was used to investigate structural risks for transgender women and transgender women sex workers cross-referenced against the key terms “stigma”, “discrimination”, “criminalization”, and “structural risks.” Abstract reviews were done on unduplicated references for relevance, with subsequent full-text review for data abstraction. Using the AACODS checklist, three reviewers (DO, MBD, AR) assessed non-peer reviewed reports to assess quality, including transparency of methods and presence of disaggregated data for transgender women or transgender women sex workers.

For the review of interventions we searched PubMed, Embase, Global Health, Scopus, PsycINFO, Sociological Abstracts, CINAHL, and Web of Science for peer-reviewed studies. Additionally, we searched the Center for Disease Control’s Compendium of Evidence-based HIV Prevention Interventions. Conference abstracts were searched from the online archives of the International AIDS Conference. The search included terms for HIV and terms for sex work (including “prostitution”), and terms associated with transgender (appendix). Active studies were searched on the NIH RePORTER database using the term “transgender”. Studies published or presented between Jan 1, 2009, and Jan 20, 2014 were included. The search was not limited by language, country, or setting. However, to meet inclusion criteria, the study had to assess an intervention for transgender women using a before and after design or comparison groups and measure one of the several outcomes: HIV testing, HIV infection, sexually transmitted infections, condom use, frequency of condomless anal intercourse, use of illicit injectable hormones or soft tissue fillers (eg, silicone). Three reviewers (TP, ASS, SIK) independently assessed the full-text articles of all selected abstracts for eligibility and data were extracted using standardised forms. Study quality was assessed based on an eight-point rigour score developed for HIV behavioural intervention systematic reviews.

See Online for appendix

For AACODS checklist see
http://dSPACE.flinders.edu.au/jspui/bitstream/2328/3326/4/AACODS_Checklist.pdf

of transgender women sell sex.⁸ A report by United Nations Development Programme (UNDP) on transgender rights and HIV in Asia estimated that 54–80% of Asian transgender women had a history of sex work, although inconsistent definitions of sex work were used by studies cited in the report.⁹ Similarly, a global meta-analysis of HIV in transgender women noted that studies often did not report or disaggregate data by history of sex work, and that many studies used sampling methods (eg, time-location sampling) that could inflate estimates of sex work.¹ These problems have restricted the quantity and quality of data specific to TSW, and thus restricted our knowledge of risks and appropriate interventions for this population.

To address knowledge gaps about TSW, we review the HIV epidemiology and risk factors at the structural, interpersonal, and individual levels, and describe the prevention interventions for TSW. Our Review focuses

specifically on sex work in transgender women, individuals categorised as male at birth who identify or express themselves as women irrespective of anatomy or medical interventions. Few data exist on sex work in transgender men, people assigned female at birth who identify or express themselves as men; thus, they are not included in our Review.^{8,10} We use mathematical modelling to assess the effect of various HIV prevention interventions on TSW in two distinct settings: Lima, Peru and San Francisco, CA, USA. Projections identify potential combination prevention interventions that are needed to halve the number of new infections within a 10-year period. Case-study scenarios provide descriptions of six regionally and epidemiologically diverse countries (India, Kyrgyzstan, Peru, South Africa, Thailand, and the USA) to show how structural, social, and epidemic contexts relate to HIV in TSW. First-person accounts emphasise why TSW must be included in the formulation of local and national HIV strategies.

HIV vulnerability: a complex interaction of multilevel risks

Structural risks: global discrimination

Because transgender women challenge gender norms, they are often socially, economically, politically, and legally marginalised.^{11–13} Discrimination against TSW stems from many forms of stigma relating to gender identity, gender expression, perceived sexual orientation, and involvement in sex work. Stigma could also be related to poverty, refugee or migration status, ethnic origin, substance misuse, and other factors. Published work from all regions has described the relation of stigma and discrimination with the general health and wellbeing of transgender women (appendix, p 3).

Legal environments worldwide express and sustain stigma for transgender women. In most countries, transgender people are either unable to obtain gender-appropriate legal identification or must undergo surgery to do so. Some transgender women do not want surgery to change their bodies. However, for those who want such procedures, the surgeries might not be covered by health insurance (either private or socialised). Undergoing surgery can be costly relative to the income of many transgender women, and few surgeons are trained to undertake genital reconstruction.

The absence of either a legally authorised or a gender-appropriate identification could heighten the risk of discrimination.¹⁴ Absence of a gender-congruent identification could affect access to a range of services, such as health care, education, employment, and voting rights.^{14,15} Many jurisdictions offer no effective and enforceable legal protections against such discrimination.^{16,17} These sociopolitical factors marginalise transgender women and can precipitate entrance into sex work.^{15,18}

Stigma, discrimination, and no legal status of transgender identity restrict economic opportunities for transgender women.¹⁹ The financial benefits of sex work

for transgender women who have little access to the formal labour market have been reported.²⁰ For example, sex work provides funds for livelihood and to pay for gender-affirming hormones, injections, and surgeries; and a more feminine appearance was reported to increase sex work earning power. Non-financial benefits of sex work for transgender women include a sense of community and social support from other TSW, and a sense of gender validation from male clients seeking their sexual services.^{21–24} Despite these potential benefits, sex work, particularly street-based sex work, could increase exposure to abuse and violence.²⁵ Studies have reported an association between violence, reduced rates of condom use, and increased risk of sexually transmitted infections in TSW.^{25–27}

TSW face many of the same structural risks as other sex workers.²⁸ Police harassment, exploitation, arrest, and violence against TSW have been reported in many countries, particularly where sodomy laws and criminalisation of sex work are used to oppress TSW.²⁹ Compared with male and natal female sex workers, TSW face greater violence from both police and clients.^{25,30} Furthermore, TSW might be at the bottom of the hierarchy of sex workers, because they receive lower pay than other sex workers despite engagement in higher risk activity.³¹ In addition to the laws used against male and female sex workers, laws prohibiting cross-dressing or impersonation of another sex are used to suppress the activities of TSW.³²

Possession of condoms is often used by law enforcement as evidence of sex work.³³ Consequences of this police practice include reduced access to condoms during sex work, reduced condom negotiation with clients, and increased condomless sexual intercourse in sex workers.^{33,34} Transgender women detained or imprisoned in connection with sex work are often placed in male facilities, where they are subject to both sexual and injection risks.³⁵ These factors create a climate of intimidation and reduce the likelihood of adherence to safer sexual practices.¹⁸ Finally, TSW often report that sexual health services ignore their needs, focusing instead on other at-risk populations such as natal female sex workers or MSM.^{11,36}

Relationship risks: partners of transgender women

The primary route for HIV transmission in transgender women is through condomless intercourse with male partners, including clients and stable and casual partners.^{1,37,38} Several studies have described how male partners can be an important source of gender validation for transgender women,^{15,21,23,24} which can undermine their intentions to engage in safer sex behaviour.^{38,39}

Despite the crucial part played by male partners and clients in HIV risk in TSW,⁴⁰ these men have been largely absent from the research literature or HIV prevention programmes.^{40–43} To our knowledge, no data specific to male clients of TSW have been reported. The sexual relationship patterns of men who have sex with

transgender women show many concurrent partners in diverse sexual networks, including natal women, men, and transgender women.^{42–44} These diverse partnerships present opportunities for HIV transmission across populations.^{42–45} Emerging data suggest that male partners of transgender women might be more likely to engage in high-risk drug-using behaviour (eg, injecting drugs, selling drugs, injecting in prison) than drug users who do not partner with transgender women.⁴⁶

Relationship status also affects sexual behaviour. TSW are more likely to have condomless receptive anal intercourse with stable partners than with clients.^{39,47–49} Within stable relationships, condomless receptive anal intercourse might show a sense of intimacy, but it has also been linked to higher rates of substance misuse and lower self-esteem and self-efficacy in transgender women.^{39,48} Additionally, many TSW report not knowing the HIV status of their partners.³⁹ Thus, stable relationships could be an important source of HIV infection for TSW.

Unprotected sex with male partners is the primary proximal HIV risk for TSW. We need research to understand the diverse sexual behaviours, identities, and methods needed to reach both TSW and their partners. Similar to natal female sex workers, TSW are less likely to use condoms with stable partners. Thus, the feasibility and acceptability of couples-focused interventions for TSW and their partners should be assessed.^{40,50}

Personal vulnerabilities: mental health and gender validation

Stigma, violence, and no social support have been associated with many mental health issues, including anxiety, depression, suicidality, and substance misuse.^{12,29,51–53} Over 60% of transgender women with a history of sex work had attempted suicide in one study.⁵³ Life stressors, depression, low self-esteem, discrimination, and substance misuse have been linked to increased sexual risk taking in transgender women.^{26,54,55} High levels of drug use have been reported in transgender women, and drugs are often used in the context of sex with partners and clients.^{29,51}

Transgender women who wish to feminise their appearance usually need hormone treatment and can undergo breast augmentation, facial feminisation surgeries, and genital surgeries.⁵ Transgender women face many barriers to accessing gender-related health care, including stigma and discrimination in medical settings, costly surgical interventions (often not covered by insurance), and few appropriately trained clinicians.^{14,52} Faced with these barriers, many use hormones without medical supervision and feminise their appearance with soft tissue fillers, such as industrial silicone, injected into the hips, buttocks, and breasts.⁵⁶ Contaminated needles for hormone or silicone injections pose a potential risk for HIV transmission; however, reported frequency of needle sharing for hormones is low, and no confirmed reports of HIV transmission through this practice have been documented.^{8,51}

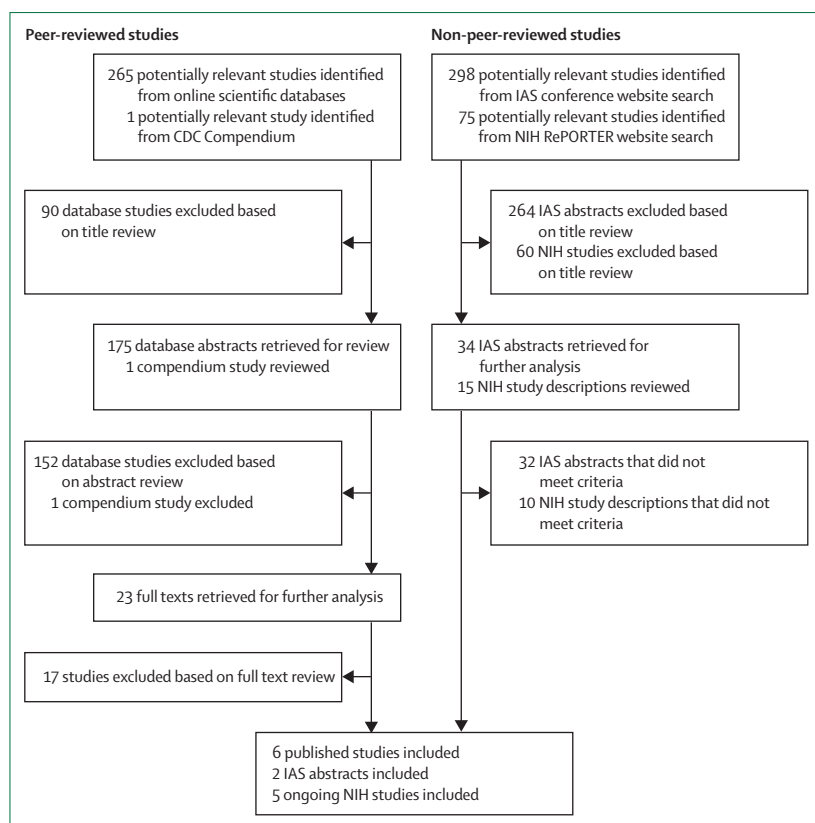


Figure 1: HIV prevention intervention systematic search protocol and results
 CDC=Centers for Disease Control and Prevention. IAS=International AIDS Society. NIH=National Institutes of Health.

Biological risks: shared and unique

Anal sex, particularly condomless receptive anal intercourse, is a highly efficient mechanism for HIV infection.⁵⁷ TSW engage in condomless receptive anal intercourse and insertive anal sex with clients and partners.^{8,48,58,59} Hormones used for feminisation can result in erectile dysfunction and interfere with correct condom use, thereby increasing HIV risk during anal insertive sex.²⁴ New data suggest that medroxy-progesterone acetate (a hormonal contraceptive) can increase HIV acquisition and viral shedding in natal women;⁶⁰ however, the effect of hormones used by transgender women on the susceptibility of the anal epithelium to HIV is unknown.

Only 11–16% of transgender women undergo vaginoplasty (appendix p 2).^{39,61} However, those who have had vaginoplasty could have additional risks through condomless receptive neovaginal intercourse.³⁹ Although the intact stratified squamous keratinised epithelium of the neovagina might be resistant to some sexually transmitted infections such as gonorrhoea and chlamydia, the use of urethral mucosa or sigmoid colon in constructing the neovagina could confer an increased risk of infection. The mechanical (ie, abrasion) and physiological (ie, accumulation of sebum and retained semen or lubricant) factors to which the neovaginal lining is

exposed could increase the risk of microtears, especially for TSW who have frequent sexual intercourse. Post-operative granulation tissue, which can persist after the initial healing period, is another biological risk.⁶²

Interventions to prevent HIV infection

Early HIV interventions for transgender women were behaviourally based and had mixed success.^{63–65} During the past 5 years, HIV prevention has changed substantially, with increasing evidence for the effectiveness of biomedical interventions such as microbicides, pre-exposure prophylaxis (PrEP), and early treatment. Evidence-based HIV interventions for transgender women include six peer-reviewed journal articles, two International AIDS Society (IAS) Conference abstracts, and five ongoing NIH-funded studies (figure 1). Details of each journal article are summarised in the appendix (pp 6–12). These studies took place in Peru, Laos, Thailand, the USA, and India. None were highly rigorous, with methodological rating scores⁶⁶ ranging from 1 to 3 out of 8, and none focused exclusively on TSW.

The study of TSW in Lima, Peru compared characteristics of those seeking HIV testing at mobile outreach units with a fixed clinical site, and noted that the mobile unit was more likely to reach transgender women and to identify previously undetected HIV in this population.⁶⁷ There were no data on the proportion of transgender women who engaged in sex work; however, findings from another study in the same city noted that 64% of transgender women report sex work as their main economic activity.⁵⁶ The study in Laos assessed the effect of an integrated social marketing approach to HIV prevention in kathoey (a Thai term for transgender women), who were not asked about sex work.⁶⁸ Intervention exposure was associated with a higher likelihood of condom use at last anal sex with casual partners and with greater use of water-based lubricant. However, the intention to use condoms with casual partners was reduced when water-based lubricant was available. Exposure to the Sisters programme in Thailand, a TSW-led HIV prevention programme that emphasises safe spaces and peer outreach, was associated with increased condom use at last sex with clients but not casual or stable partners. Greater than 90% of the study sample were sex workers.⁶⁹ The pilot study in the USA assessed Girlfriends, a group-level HIV behavioural risk reduction intervention for adults.⁷⁰ 38% of participants had engaged in sex work in the previous 3 months. After completion of the group sessions, participants reported fewer sexual partners and were less likely to have condomless anal sex with clients or condomless sex at last vaginal or anal sex with female and male partners.

Two studies in India (Andhra Pradesh and Tamil Nadu provinces) assessed the Avahan programme. Avahan is a well known large-scale HIV-prevention intervention for key populations worldwide.⁷¹ Established in 2003, Avahan

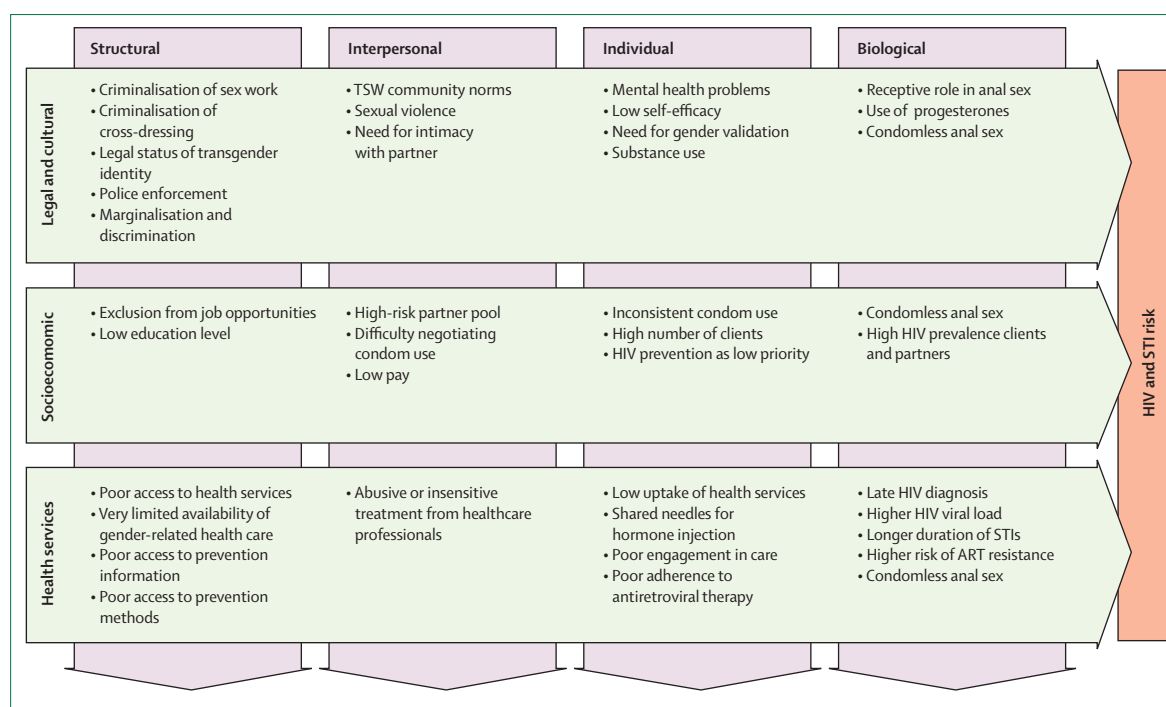


Figure 2: Conceptual framework for selected factors leading to increased HIV infection risk in TSW

Horizontal arrows show the association between higher level and biological factors, whereas vertical arrows show how effects in one domain can propagate to other domains. TSW=transgender women sex workers. STI=sexually transmitted infection. ART=antiretroviral therapy.

includes community engagement and empowerment, peer outreach, treatment of sexually transmitted infections, condom and lubricant distribution, community mobilisation, and advocacy for an enabling environment.⁷¹ In Andhra Pradesh, transgender women and MSM were more likely to report consistent condom use after Avahan implementation compared with baseline; the proportion HIV-positive after implementation did not change.⁷² Whereas only 4% of the sample reported sex work as their main occupation, 38–52% reported ever having a paying male partner. In Tamil Nadu, transgender women (20–40% were TSW) had reductions in both syphilis and HIV prevalence after implementation of the programme compared with baseline.⁷³

The CDC compendium of evidence-based behavioural interventions has none tailored for transgender women. However, the website provides a link to information about adapting the SISTA intervention for transgender women of colour.⁷⁴ SISTA is a group-level intervention shown to increase condom use in African-American women. T-SISTA, the adaptation guide, includes transgender-specific HIV vulnerability, sex work, adaptation examples and suggestions, and a Sheroes transgender pride campaign. No assessment of T-SISTA was reported in the published literature.

Two studies were identified in IAS abstracts from 2009 to 2013, one from the USA and the other was multinational. The USA-based study described an

assessment of the Transgender Family Programme,⁷⁵ which included the implementation of transgender-friendly clinic policies, standards, and training, and integration of HIV and gender care in a medical home model. The investigators did not describe the proportion of TSW, but they did report a significant decrease in sex work, needle sharing, unregulated hormone injections, and an increase in regular condom use in transgender women after participation in the programme. HIV prevalence in programme participants fell from 44% in 2007 to 38·3% in 2011 with one seroconversion during that period.

The other study was a secondary analysis of findings from the iPrex multinational study of PrEP in MSM and transgender women.⁷⁶ In the 366 iPrex participants (15%) who self-identified as transgender women or who reported using feminising hormones, there was no difference in new infections ($n=11$) in the treatment versus placebo group. PrEP was estimated to increase risk by 4% for transgender women and decrease risk by 49% for MSM; however, this difference was not statistically significant ($p=0\cdot13$). Although the presenters suggested various reasons for the difference, no data were provided.

In the NIH database of active studies, there are five studies designed to test or assess HIV interventions in transgender women: a feasibility study of an antistigma intervention in health-care providers in Mumbai, India to improve access to HIV services for hijra (a south Asian term for transgender women); a feasibility study of a

	Lever	Size	Effectiveness	Coverage	Scale-up	Interventions
A	Higher condom use with clients	20%	80%	100% TSW and TSW-SP	Immediate	Periodic condom inundation coupled with condom negotiation skills; reduction in sexual violence through development and enforcement of protective laws and no police harassment; reduction of financial need
B	Higher condom use with stable partners	20%	80%	100% TSW-SP	Immediate	Periodic counselling to improve self-esteem and value health; condom erotisation skills; reduction in sexual violence
C	Fewer commercial transactions	20%	100%	100% TSW and TSW-SP	Immediate	Cash transfers or alternative economic activities to supplement sex work income; protective legal environment allowing to charge more
D	PrEP in TSW	..	44%	20% TSW and TSW-SP	2 years	Community mobilisation coupled with improved access to health services to prescribe PrEP, monitor HIV status, and provide strong adherence support
E	Early ART in TSW and stable partners	Lima, 2 years after infection; San Francisco, CA, 1 year after infection	92%	Lima, 40%; San Francisco, CA, 80% TSW, TSW-SP, and stable partners	Lima, 5 years; San Francisco, CA, 2 years	Community mobilisation coupled with improved access to health services to ensure frequent testing, linkage to care, and adherence monitoring; alternative testing strategies such as mobile clinics or home-based testing could lead to higher testing frequency

Changes are relative to the baseline. TSW=transgender women sex workers who are single. TSW-SP=transgender women sex workers who have a stable partner. PrEP=pre-exposure prophylaxis. ART=antiretroviral therapy.

Table: Description of changes in proximate factors modelled and associated interventions by code

telemedicine approach to improve engagement in care in transgender women of colour in Washington, DC; a randomised controlled trial of the LifeSkills programme (a six-session, peer-led, group intervention for sexually active transgender women aged 16–24 years) in Boston and Chicago (although not restricted to TSW, the sessions address survival sex and sex work);⁷⁷ a randomised controlled trial of T-Talk, a peer-led harm reduction and social support intervention for transgender women in New York City, NY, including TSW; and a pilot randomised controlled trial of Sheroes, a five-session group intervention based on gender affirmation in the USA.

Testing and adherence in the midst of other health priorities

Knowledge of HIV status and treatment adherence is essential for effective interventions based on antiretroviral therapy. In studies from Canada and Thailand only half of transgender women had ever been tested for HIV.^{10,54} Findings from other studies show that transgender women with HIV were less likely to receive antiretroviral therapy⁷⁸ and less likely to report adherence⁷⁹ than non-transgender participants. Transgender women who engage in sex work could face barriers to HIV testing and antiretroviral adherence due to similar structural factors that increase their vulnerability to HIV.⁸⁰ Stigma, past negative experiences, prioritisation of hormone therapy, and concerns about drug interactions between antiretroviral drugs and hormone therapy affect adherence in transgender women.⁸¹ During a WHO consultation on HIV prevention in sex workers, TSW identified the need for recognition of their specific health-care requirements (eg, hormone therapy and gender-appropriate education materials) within HIV strategies and services.⁸² Culturally competent, gender-affirming HIV care that integrates transition-related needs could be an effective facilitator of engagement in care and antiretroviral adherence for TSW.⁸³

Assessment of HIV preventive interventions for TSW by mathematical modelling

Mathematical modelling was used to identify the combination of interventions needed to halve the number of new infections within 10 years in TSW in two diverse social and epidemiological settings for which sufficient data were available: Lima, Peru and San Francisco, CA, USA. This is a development goal of the UN General Assembly, and is a crucial first step to guide programmatic planning for HIV prevention. The cities differ in HIV care coverage, patterns of sexual positioning in TSW, and income level. We built a deterministic model of HIV transmission in TSW, their male clients, and male stable partners, accounting for sexual positioning and differences in behaviour in TSW with each partner type. The model was parameterised with and fit to data from each setting, and intervention effects were based on the findings of our Review and relevant interventions shown to be effective in other populations (ie, PrEP and early antiretroviral therapy; appendix, pp 13–30).

We assessed the effect of realistic changes in proximate determinants that directly affect infection (condom use, number of partners, infectiousness) and that can be quantified in a model. However, changes in proximate determinants can only be made through appropriate interventions that consider the upstream psychosocial, social, and structural factors as shown in our conceptual framework (figure 2). For example, legal rights and better working conditions could allow TSW to earn a higher income with fewer clients, thereby decreasing their risk, especially in settings where TSW have a high client volume. The table gives a description of the changes in the proximate factors modelled, their size relative to the baseline value, associated effectiveness, coverage, and the type of interventions that would be needed. Interventions were systematically tested to identify which coverage levels and combinations could reach the desired aim. Cost was not included in this analysis because our focus was

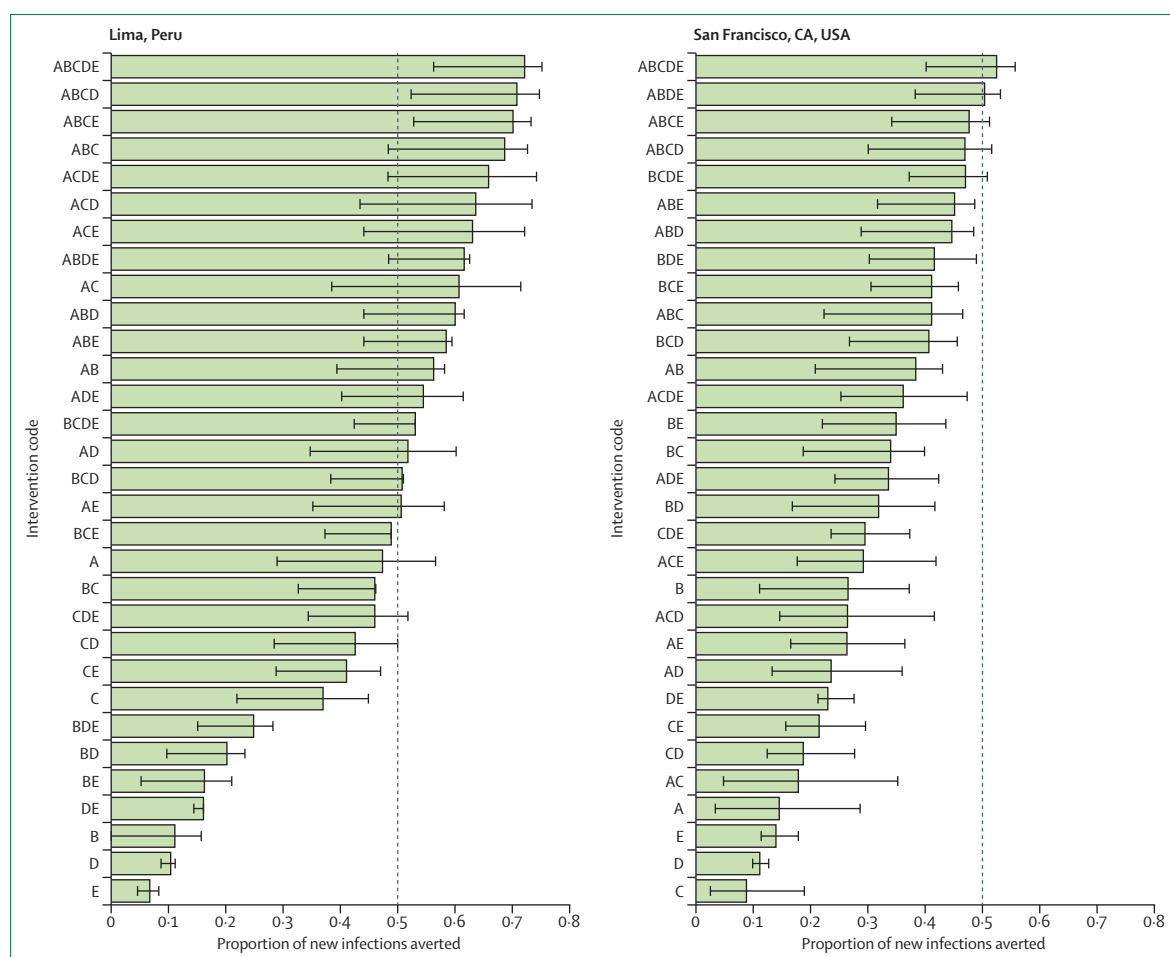


Figure 3: Proportion of new infections averted in transgender women sex workers (TSW) over 10 years with each intervention in isolation and in combination in Lima, Peru and San Francisco, CA, USA

The histograms are the best-fitting baseline epidemiological scenario. The error bars are the minimum and maximum effects obtained for the ten best epidemiological scenarios. A=condom use with clients (+20%). B=condom use with stable partners (+20%). C=number of commercial transactions (~20%). D=pre-exposure prophylaxis to 20% of all TSW (44% effectiveness). E=test and treat in TSW and stable partners (40% 2 years after infection in Lima, 80% 1 year after infection in San Francisco).

achieving substantial reduction in new infections in TSW. In Lima, when realistic coverage and effectiveness estimates are considered, the individual interventions with the greatest effect on incidence were increased condom use with clients (A) and decreased number of commercial transactions (C; figure 3). 50% reduction in new infections was achieved with a 20% increase in condom use with clients in combination with one of any of the other interventions. In the absence of an increase in condom use with clients, the combination of at least three interventions including a 20% reduction in commercial transactions, a 20% increase in condom use with stable partners, and PrEP use in 20% of TSW was needed, suggesting that reducing condomless sex with clients might be essential to achieve the proposed goal in this setting. In San Francisco, where coverage of antiretroviral therapy is higher and the number of clients lower, a 50% reduction in new infections needs the combination

of at least four interventions. A 20% increase in condom use with clients and stable partners, a 20% PrEP coverage, and treatment of 80% of HIV-positive patients 1 year after infection would be needed, although other combination prevention scenarios result in similar reductions. In isolation, the most effective intervention is an increase in condom use with stable partners. A high proportion of TSW in San Francisco report having a stable partner (nearly 70%) and condom use is lower with partners than with clients.

Although early treatment can reduce HIV transmission in discordant heterosexual couples,⁹ no studies have examined its effectiveness in TSW. Our models estimate that test and treat of TSW would achieve more than 10% reduction in new infections in San Francisco and less in Peru due to lower coverage and testing frequency. Therefore, a combination of interventions that can include, but are not restricted to, early treatment might be

most appropriate for TSW. These modelling analyses showed that a 50% decrease in HIV incidence in 10 years is an achievable goal in these two settings when implementing a tailored combination of feasible interventions. However, sustainability is crucial as these

interventions must be maintained throughout the entire period for the effect to be evident. Lasting change is best achieved through TSW-led strategies that address the distal (eg, violence) and proximal (eg, substance misuse) barriers to making those changes.

Panel: Community voices

Gulam, a peer educator with SWEAT, a local sex workers organisation, in Cape Town

I became a sex worker at the age of 19. I had finished school and my family left me alone in Cape Town. I had nowhere to go. I was living with people here, but I needed to have some income. I got into sex work through some of my friends at the time. I had never thought before when I had sex that people would pay something. But one guy paid me and that gave me a little bit of hope because in those days work was scarce and I did not have qualifications and skills. I realised that sex work is a type of work that you can do. It was so unexpected and it helped me a lot to get a stable life and to support myself, to pay my way through life.

But there are challenges—we face a lot of challenges, from client abuse to police harassment, and interpartner relationships. It is difficult, especially when the community start discriminating against you. There is a lot of stigma that goes around. Transgender women get that unwelcome feeling, they feel rejected at the clinics and the health-care service, and they feel discriminated against. Sometimes they do not attend their own clinics in their communities—they would rather go somewhere else, or they call us, so that one of us can go fetch them and take them to a friendly clinic, because we run a support group for transgender sex workers. For us, the coordinators and facilitators, we need to be strong, because somebody needs to be strong for them, so that at the end of the day when they leave our group they can feel relieved.

We do sensitisation at the clinics, from the receptionists up to the sister in charge. We want to show them that all people are human beings, and health care is there for everybody. Because who knows what the face of a sex worker looks like? To me, everybody is a sex worker. The best thing for me about being a peer educator is when we go out and we give our services to the sex workers, the faces that you see, the relief, they do not even have words to say thank you because they are too overwhelmed with the help that we give them. We help them at the Department of Home Affairs, assist them to attend clinics, assist them at hospitals, and assist them if the police arrest them. We make our voices heard—on what basis do these people have to suffer, they are human beings and they obey the law.

So it gives me great pleasure at the end of the day to say, “another day, another job well done”. You do not need a medal, just a simple thank you. I love my job and I love what I am doing, and I will still be doing it for many years to come, even when I am old and grey and retired my voice will still be there to be heard.

Joya Sikder: the journey of a hijra (transgender) from a sex worker to President of the National Platform of Sex Workers and President of Somporker Noya Setu, a national community based organisation (CBO) working for the rights of sexual minorities, in Dhaka, Bangladesh

I realised I was different when I was 8 or 9 years old. I loved cross-dressing, playing with girls, and being feminine. The ridicule started from my family and continued at school. When I was only 12 years old, I was raped by a neighbour on my way to school. It was a terrible experience, and I stopped going to school after that because of fear, denial, and guilt.

Later, I met some hijra and for the first time, I realised that I am a hijra. I used to visit them every day, and I learnt their special language called *ulti*. At age 16, I came to Dhaka with my family, and we were unexpectedly stricken by extreme poverty. There, I found some hijra who became my best friends. Once, I visited a hijra's residence and two hijra were counting money, lots of money! My friends told me that this money came from the sex trade and it was their earnings from one night only! I was so convinced that I became a sex worker.

Life as a sex worker was full of humiliations. Forced sex, physical abuse, and theft were common. Stigma was overwhelming, and I might even be sent to prison for having sex with males. I did not want to accept this situation, so when CARE approached hijras to work with us in 1998, I became an outreach worker for my community. Initially, when I gave condoms to other hijras, they made fun of me, saying condoms are to prevent pregnancy. That changed in 1999 when a national surveillance study found that a lot of us had syphilis.

We started thinking about how to address stigma and protect ourselves from HIV and other sexually transmitted infections. In 2000, we formed *Badhan Hijra Sangha*, a CBO for the hijra community. I learnt a lot in the process of forming this CBO. I also worked on surveillance studies and with a DFID-funded research project with International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b). This was a wonderful experience for me. I learnt about professionalism, management, networking, adaptability, and it shaped my leadership skills. I formed and led a hijra improvisational theatre group, *Rongberongthat*, that performed in front of national and international audiences. I joined the global fund project of icddr,b in 2010 and have been continuing with this project through which I have received an opportunity to directly work for the hijra community of Bangladesh.

(Continues on next page)

(Continued from previous page)

I have attended workshops and represented the hijra community in several countries. These experiences helped to shape my dream: a society free of stigma and discrimination against sexual minorities. In 2009, I was elected as the President of the Sex Workers Network of Bangladesh and was able to work for all sex workers, including hijra sex workers.

With this experience, I formed another CBO in 2010, Somporker Noya Setu. Through this CBO, I address developmental needs, health issues, stigma reduction, and capacity building for all sexual minorities, not just hijra.

Stigma persists. Some of my family members still do not accept me as a hijra. But, at the end of the day, I forget all this pain when I think about the love and respect I have received not only from the hijra community, but from all sex workers and sexual minorities and from many others who work for our community. It will take time to eliminate stigma and for society to acknowledge people outside the male–female gender dichotomy. However, the movement has started and we are on the right track. The Government of Bangladesh has officially approved the existence of hijra as a separate gender category in November 2013. Now I dream that based on this official approval, the hijra of Bangladesh will enjoy their gender identity along with males and females and their rights in all aspects as separate gender will be preserved and their lives will be protected.

Rose's story, Nepal

Growing up, my family did not have a lot of money or social status in the city in Nepal where we lived. My family tried to give my sister and me a good education and life, but when I was 15 I started being harassed in school because I was more feminine than the other boys. I could not share this situation with my family, so instead I started skipping school to deal with the abuse.

When I realised at 17 that I wanted to become a woman—that I was transgender—I left school. I started staying overnight with my transgender friends in Kathmandu where I felt freer, and soon I had moved out from my home to a shared house with other transgender people. Slowly they introduced me to sex work as a means of getting money—because I did not have

educational qualifications and now needed to support myself, it was the only way to make money. I also feared stigma and discrimination if I tried to get another job—I was dressing like a woman but the transition was not complete and they would know I was transgender.

I would sell sex every night, and I had to go everywhere and deal with clients of all ages. Once I was physically harassed by someone in the military—I was forced to have a sexual relationship with him, and as a younger person I did not know how to deal with the situation. I was too young to know I could say no. He threatened me that if I said no he would take me to the police.

I am still afraid to go to the health services because I am transgender. They do not understand and do not want to provide services to me. There is no specific place to go and have a check-up. I cannot access hormone treatment so I use contraceptive pills—I have taken two pills per day for 2 years.

Because of the stress of sex work, I decided to go abroad to the Middle East for work. My parents were pressuring me as their only son to make more money to support the family. I worked in domestic work but I was raped. Because I had been a sex worker I did not think I could report it, so I never told anyone. The household owner sent me back to Kathmandu where I now live.

My family still does not know I am transgender; when I go home, I wear my hair up and dress like a boy. I lead a double life, and it is really hard to manage.

There are many young transgender people like me who want to pursue an education, but they cannot due to the bullying and harassment. We are stuck in society, outside the social norms and without options for our future. Many young transgender sex workers try to commit suicide due to this stigma and discrimination. We have low self-esteem and other issues that are hard to overcome.

I would love to see laws and policies being implemented that protect our rights. I hope in the future that there is gender equality, so we do not have to hide and we can just be who we are. We want to access the things other young people access—education and employment.

For **Sex Workers Network of Bangladesh** see <http://www.swnob.com/>

For **Somporker Noya Setu** see <http://www.bengalfoundation.org/index.php?view=event/EventInfo.php&eventID=71> and <http://www.newagebd.com/detail.php?date=2012-06-08&nid=12978#UciHbjvtAU>

Country case studies: examining TSW risks in context

Case studies provide contextual information that is essential for appropriate design and implementation of programmes for TSW. Six countries (India, Kyrgyzstan, Peru, South Africa, Thailand, and the USA) were selected to represent heterogeneous political, social, and epidemic contexts, and present data and gaps in knowledge. Countries were selected on the basis of geographical, epidemic, and demographic diversity, and whether there were data available from peer-reviewed publications or programmatic reports on transgender women or TSW from that country. Structural, social, and individual level

data for each of these six countries were reviewed and are described in the appendix (pp 38–40). The case studies describe how comprehensive interventions identified by the modelling could be implemented in each setting.

Recent data related to the epidemic context for TSW have been identified in India, Thailand, Peru, and the USA. An early understanding of HIV risks and prevalence in transgender women in these settings arose from HIV research in MSM, although epidemiology and intervention research has begun to focus separately on transgender women, and particularly TSW. In these settings, there are opportunities to better understand the specific HIV-related risks and needs of TSW, and to test acceptable,

comprehensive, HIV prevention interventions. Thailand and India provide cultural contexts as countries in which transgender women have social (and now legal recognition, in India) as a third gender.

In countries such as Kyrgyzstan and South Africa, the understanding of HIV epidemiology in TSW is still nascent. Community-based and human rights organisations have increased visibility and mitigated stigma and violence against transgender people, including TSW. More research on HIV epidemiology and appropriate interventions for TSW are needed in these settings, ideally in collaboration with the community groups and human rights defenders already working towards the wellbeing of TSW. Detailed case-study descriptions for each country are provided in the appendix (pp 31–45).

Common themes, common struggles

TSW bear a disproportionate burden of HIV compared with other key populations worldwide (panel). Rigorous research, tailored interventions, and an improved environment for accessing HIV services have not progressed quickly enough. Although our aim was to identify and synthesise findings from studies worldwide, HIV research with transgender populations is scarce in sub-Saharan Africa, eastern Europe, and central Asia. Research is needed to understand the epidemiology and social context for TSW, and should begin by engaging existing transgender advocates and communities in those regions, and ensuring that data are disaggregated by sex, gender, and sex work status.

Where data were available, we note that stigma, discrimination, and exclusion from social and economic opportunities were common and served as the impetus for many transgender women to sell sex.⁴ For some TSW, sex work provides a way to find community and affirm their femininity.^{21,23,24,84} Within the context of sex work, economic distress and social disadvantage make it difficult for many TSW to protect themselves from HIV.⁸⁵ The intersection of legal and social discrimination based on sex work, gender identity, and perceived sexual orientation form barriers to HIV prevention and care. Stigma, discrimination, and violence against TSW need to be addressed to enable them to protect their health.

Mathematical modelling has shown that reductions in sexual violence against natal female sex workers can lead to substantial reductions in new HIV infections,⁸⁶ and the same outcome is probable for TSW. Victimisation, substance use, and psychological distress promote HIV risk in TSW.^{87,88} Lessons learned from large-scale interventions, such as Avahan, emphasise the importance of multilevel approaches that address structural and individual risks.^{79,89} Access to legal gender change, economic and community empowerment, strong support networks, culturally competent mental and behavioural health services, and appropriate gender-related care are key components of effective HIV interventions for TSW.^{13,16,90,91}

Few evidence-based behavioural interventions exist for transgender women, and no interventions have been specifically designed for TSW. Although some NIH-funded studies are underway that might include TSW as a subset of transgender women, all but one are taking place in the USA, underscoring the need for intervention research in TSW outside North America.

Stratification by transgender and sex work status as the foundation for constructing scientific evidence

The lower effectiveness of PrEP in transgender women than MSM in the iPrex⁹² substudy raises questions about the best way to use this new HIV prevention approach. In our mathematical models, 20% PrEP coverage resulted in a 8–13% reduction in new infections in TSW. Strategically prioritising transgender women and high-risk MSM for PrEP could be a cost-effective intervention in some settings.^{93,94} However, both models assumed that PrEP was equally effective for MSM and transgender women. Acceptability of microbicides has been reported as greater than 90%⁹⁵ but only 37% for PrEP.⁹⁶ Research to confirm these findings and better understand the reasons for differences in effectiveness and acceptability is essential for the strategic use of PrEP in TSW.

Conclusions

Our Review, including the modelling analysis, was constrained by the limited quantity and quality of published research on HIV in TSW. Funders need to prioritise the research gaps for this population. An analysis of funding patterns at NIH⁹⁸ showed that only 0·1% of all NIH-funded studies addressed lesbian, gay, bisexual, and transgender health concerns and, of that 0·1%, less than 7% studied transgender populations. The near absence of NIH-funded research helps to perpetuate health disparities.⁹⁸ A greater prioritisation of TSW in HIV research, prevention, care, and treatment is necessary to address the gaps in data and services in this population that is burdened by HIV.

Contributors

TP and DO designed the Review and wrote the initial conceptual outline. TP wrote the first full draft of the manuscript. AR, SW, DO, MBD, and AS-S undertook the comprehensive literature review of HIV risk. TP, AS-S, and SIK did the systematic review of HIV prevention interventions. AB designed, completed, and described the modelling exercises. ALW developed and wrote the country case studies. All authors contributed to the interpretation of the findings and each author reviewed, edited, and approved the final manuscript.

Declaration of interests

We declare no competing interests.

Acknowledgments

We thank Mike Pickles and Tim Hallett for their support with the modelling. This Review was made possible with help from the Johns Hopkins University Center for AIDS Research, an National Institutes of Health (NIH)-funded programme (1P30AI094189), which is supported by these NIH co-funding and participating institutes and centres: National Institute of Allergy and Infectious Diseases (NIAID), National Cancer

Institute (NCI), National Institute for Child Health and Development (NICHD), National Heart, Lung, and Blood Institute (NHLBI), National Institute for Drug Abuse (NIDA), National Institute of Mental Health (NIMH), National Institute on Aging (NIA), Fogarty International Center (FIC), National Institute of General Medical Sciences (NIGMS), National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), and Office of AIDS Research (OAR). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. This Review and The *Lancet* Series on HIV and sex workers were supported by grants to the Center for Public Health and Human Rights at Johns Hopkins Bloomberg School of Public Health from the Bill & Melinda Gates Foundation and from the UN Population Fund. No authors have been paid to write this manuscript by a pharmaceutical company or other agency. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

References

- Baral SD, Poteat T, Stromdahl S, Wirtz AL, Guadamuz TE, Beyrer C. Worldwide burden of HIV in transgender women: a systematic review and meta-analysis. *Lancet Infect Dis* 2013; **13**: 214–22.
- Operario D, Soma T, Underhill K. Sex work and HIV status among transgender women: systematic review and meta-analysis. *J Acquir Immune Defic Syndr* 2008; **48**: 97–103.
- Stephens T, Cozza S, Braithwaite RL. Transsexual orientation in HIV risk behaviours in an adult male prison. *Int J STD AIDS* 1999; **10**: 28–31.
- UNAIDS. Global report: UNAIDS report on the global AIDS epidemic, 2012. http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/20121120_UNAIDS_Global_Report_2012_with_annexes_en.pdf (accessed June 30, 2013).
- Coleman E, Bockting WO, Botzer M, et al. Standards of care for the health of transsexual, transgender, and gender-nonconforming people, version 7. *Int J Transgender* 2011; **13**: 165–232.
- Jenkins C, Pramroj na A, Hunter A. Katoy in Thailand: HIV/AIDS and life opportunities. Washington, DC: Futures Group: Policy Project, 2005.
- Hwahng SJ, Nuttbrock L. Sex workers, fem queens, and cross-dressers: differential marginalizations and HIV vulnerabilities among three ethnocultural male-to-female transgender communities in New York city. *Sex Res Soc Policy* 2007; **4**: 36–59.
- Herbst JH, Jacobs ED, Finlayson TJ, et al. Estimating HIV prevalence and risk behaviors of transgender persons in the United States: a systematic review. *AIDS Behav* 2008; **12**: 1–17.
- Cohen MS, Chen YQ, McCauley M, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *New Engl J Med* 2011; **365**: 493–505.
- Bauer GR, Travers R, Scanlon K, Coleman TA. High heterogeneity of HIV-related sexual risk among transgender people in Ontario, Canada: a province-wide respondent-driven sampling survey. *BMC Public Health* 2012; **12**: 292.
- Boyce S, Barrington C, Bolanos H, Arandi CG, Paz-Bailey G. Facilitating access to sexual health services for men who have sex with men and male-to-female transgender persons in Guatemala City. *Cult Health Sex* 2012; **14**: 313–27.
- Bockting WO, Miner MH, Swinburne Romine RE, Hamilton A, Coleman E. Stigma, mental health, and resilience in an online sample of the US transgender population. *Am J Public Health* 2013; **103**: 943–51.
- Baral S, Beyrer C, Poteat T. Human rights, the law, and HIV among transgender people. Working Paper prepared for the Third Meeting of the Technical Advisory Group of the Global Commission on HIV and the Law, 7–9 July 2011.
- Grant JM, Mottet LA, Tanis J, Harrison J, Herman JL, Keisling M. Injustice at every turn: a report of the National Transgender Discrimination Survey. Washington: National Center for Transgender Equality and National Gay and Lesbian Task Force, 2011.
- Sausa LA, Keatley J, Operario D. Perceived risks and benefits of sex work among transgender women of color in San Francisco. *Arch Sex Behav* 2007; **36**: 768–77.
- TVT. Legal and healthcare mapping. Europe: Trans Respect Versus Transphobia Worldwide, 2012.
- Godwin J. Legal environments, human rights and HIV responses among men who have sex with men and transgender people in Asia and the Pacific: an agenda for action. Bangkok: UNDP Asia Pacific Regional Centre, 2010.
- Winter S, King M. Chapter 9: Well and truly fucked: transwomen, stigma, sex work, and sexual health in South to East Asia. In: Dalla R, Bakter L, DeFrain J, Williamson C, eds. *Global perspectives on prostitution and sex trafficking: Africa, Asia, Middle East and Oceania*. Lanham: Lexington Books, 2011.
- Salazar X, Villayán J. La situación de la población Trans el Perú en el contexto del acceso universal a tratamiento, atención y apoyo en VIH/SIDA. 2010. Lima: IESSDEH, ONUSIDA (in Spanish).
- Winter S. Lost in transition: transgender people, rights and HIV vulnerability in the Asia-Pacific region. Bangkok: UNDP Asia Pacific Regional Center, 2012.
- Sevelius JM. Gender affirmation: a framework for conceptualizing risk behavior among transgender women of color. *Sex Roles* 2013; **68**: 675–89.
- Sausa LA, Keatley J, Operario D. Perceived risks and benefits of sex work among transgender women of color in San Francisco. *Arch Sex Behav* 2007; **36**: 768–77.
- Nuttbrock L, Hwahng S, Bockting W, et al. Lifetime risk factors for HIV/sexually transmitted infections among male-to-female transgender persons. *J Acquir Immune Defic Syndr* 2009; **52**: 417–21.
- Bockting WO, Robinson BE, Rosser BRS. Transgender HIV prevention: a qualitative needs assessment. *AIDS Care* 1998; **10**: 505–25.
- Cohan D, Lutnick A, Davidson P, et al. Sex worker health: San Francisco style. *Sex Transm Infect* 2006; **82**: 418–22.
- Clements-Nolle K, Guzman R, Harris SG. Sex trade in a male-to-female transgender population: psychosocial correlates of inconsistent condom use. *Sexual Health* 2008; **5**: 49–54.
- Hill SC, Daniel J, Benzie A, Ayres J, King G, Smith A. Sexual health of transgender sex workers attending an inner-city genitourinary medicine clinic. *Int J STD AIDS* 2011; **22**: 686–87.
- Shannon K, Strathdee SA, Goldenberg SM, et al. Global epidemiology of HIV among female sex workers: influence of structural determinants. *Lancet* 2014; published online July 22. [http://dx.doi.org/10.1016/S0140-6736\(14\)60931-4](http://dx.doi.org/10.1016/S0140-6736(14)60931-4).
- Nemoto T, Operario D, Keatley J, Villegas D. Social context of HIV risk behaviours among male-to-female transgenders of colour. *AIDS Care* 2004; **16**: 724–35.
- Abdullah MA, Basharat Z, Kamal B, et al. Is social exclusion pushing the Pakistani Hijras (transgenders) towards commercial sex work? A qualitative study. *BMC Int Health Human Rights* 2012; **12**: 32.
- Boles J, Elifson KW. The social organization of transvestite prostitution and AIDS. *Soc Sci Med* 1994; **39**: 85–93.
- Open Society Foundation. Laws and policies affecting sex work. New York: OSF, 2012.
- Rhodes T, Simic M, Baros S, Platt L, Zikic B. Police violence and sexual risk among female and transvestite sex workers in Serbia: qualitative study. *BMJ* 2008; **337**: a811.
- Shannon K, Strathdee SA, Shoveller J, Rusch M, Kerr T, Tyndall MW. Structural and environmental barriers to condom use negotiation with clients among female sex workers: implications for HIV-prevention strategies and policy. *Am J Public Health* 2009; **99**: 659–65.
- Harawa NT, Sweat J, George S, Sylla M. Sex and condom use in a large jail unit for men who have sex with men (MSM) and male-to-female transgenders. *J Health Care Poor Underserved* 2010; **21**: 1071–87.
- Ayala G, Hebert P, Keatley J, Sundararaj M. An analysis of major HIV donor investments: targeting men who have sex with men and transgender people in low and middle-income countries. Oakland: MSM Global Forum, 2011.
- Altaf A, Zahidie A, Agha A. Comparing risk factors of HIV among hijra sex workers in Larkana and other cities of Pakistan: an analytical cross sectional study. *BMC Public Health* 2012; **12**: 279.
- Operario D, Nemoto T, Iwamoto M, Moore T. Unprotected sexual behavior and HIV risk in the context of primary partnerships for transgender women. *AIDS Behav* 2011; **15**: 674–82.

- 39 Nemoto T, Iwamoto M, Perngparn U, Areesantichai C, Kamitani E, Sakata M. HIV-related risk behaviors among kathoey (male-to-female transgender) sex workers in Bangkok, Thailand. *AIDS Care* 2012; **24**: 210–19.
- 40 Operario D, Burton J, Underhill K, Sevelius J. Men who have sex with transgender women: challenges to category-based HIV prevention. *AIDS Behav* 2008; **12**: 18–26.
- 41 Mauk D, Perry A, Munoz-Laboy M. Exploring the desires and sexual culture of men who have sex with male-to-female transgender women. *Arch Sex Behav* 2013; **42**: 793–803.
- 42 Reback CJ, Larkins S. HIV risk behaviors among a sample of heterosexually identified men who occasionally have sex with another male and/or a transwoman. *J Sex Res* 2013; **50**: 151–63.
- 43 Reisner S, Mimiaga M, Bland SE, Driscoll MA, Cranston K, Mayer KH. Pathways to embodiment of HIV risk: black men who have sex with transgender partners, Boston, MA. *AIDS Educat Prevention* 2012; **24**: 15–26.
- 44 Bocking W, Miner M, Rosser BR. Latino men's sexual behavior with transgender persons. *Arch Sex Behav* 2007; **36**: 778–86.
- 45 Operario D, Nemoto T, Iwamoto M, Moore T. Risk for HIV and unprotected sexual behavior in male primary partners of transgender women. *Arch Sex Behav* 2011; **40**: 1255–61.
- 46 Beyrer C, Sripaipan T, Tovanabutra S, et al. High HIV, hepatitis C and sexual risks among drug-using men who have sex with men in northern Thailand. *AIDS* 2005; **19**: 1535–40.
- 47 Elifson KW, Boles J, Posey E, Sweat M, Darrow W, Elsea W. Male transvestite prostitutes and HIV risk. *Am J Public Health* 1993; **83**: 260–62.
- 48 Nemoto T, Bodeker B, Iwamoto M, Sakata M. Practices of receptive and insertive anal sex among transgender women in relation to partner types, sociocultural factors, and background variables. *AIDS Care* 2014; **26**: 434–40.
- 49 Nemoto T, Operario D, Keatley J, Han L, Soma T. HIV risk behaviors among male-to-female transgender persons of color in San Francisco. *Am J Public Health* 2004; **94**: 1193–99.
- 50 Weinberg MS, Williams CJ. Men sexually interested in transwomen (MSTW): gendered embodiment and the construction of sexual desire. *J Sex Res* 2010; **47**: 374–83.
- 51 Clements-Nolle K, Marx R, Guzman R, Katz M. HIV prevalence, risk behaviors, health care use, and mental health status of transgender persons: implications for public health intervention. *Am J Public Health* 2001; **91**: 915–21.
- 52 Fredriksen-Goldsen KI, Cook-Daniels L, Kim HJ, et al. Physical and mental health of transgender older adults: an at-risk and underserved population. *The Gerontologist* 2014; **54**: 488–500.
- 53 Nemoto T, Bodeker B, Iwamoto M. Social support, exposure to violence and transphobia, and correlates of depression among male-to-female transgender women with a history of sex work. *Am J Public Health* 2011; **101**: 1980–88.
- 54 Nuttbrock L, Bocking W, Rosenblum A, et al. Gender abuse, depressive symptoms, and HIV and other sexually transmitted infections among male-to-female transgender persons: a three-year prospective study. *Am J Public Health* 2013; **103**: 300–07.
- 55 Hotton AL, Garofalo R, Kuhns LM, Johnson AK. Substance use as a mediator of the relationship between life stress and sexual risk among young transgender women. *AIDS Educat Prevention* 2013; **25**: 62–71.
- 56 Silva-Santisteban A, Raymond HF, Salazar X, et al. Understanding the HIV/AIDS epidemic in transgender women of Lima, Peru: results from a sero-epidemiologic study using respondent driven sampling (unpublished estimates of transgender sex workers). *AIDS Behav* 2012; **16**: 872–81.
- 57 Baggaley RF, White RG, Boily MC. HIV transmission risk through anal intercourse: systematic review, meta-analysis and implications for HIV prevention. *Int J Epidemiol* 2010; **39**: 1048–63.
- 58 Jin F, Jansson J, Law M, et al. Per-contact probability of HIV transmission in homosexual men in Sydney in the era of HAART. *AIDS* 2010; **24**: 907–13.
- 59 Inciardi JA, Surratt HL, Telles PR, Pok BH. Sex, drugs, and the culture of travestismo in Rio de Janeiro. *Int J Transgenderism* 1999; **3**: 1.
- 60 Heffron R, Donnell D, Rees H, et al. Use of hormonal contraceptives and risk of HIV-1 transmission: a prospective cohort study. *Lancet Infect Dis* 2012; **12**: 19–26.
- 61 Guadamuz T, Wimonasate W, Varangrat A, et al. HIV prevalence, risk behavior, hormone use and surgical history among transgender persons in Thailand. *AIDS Behav* 2011; **15**: 650–58.
- 62 Jarolim L, Sedy J, Schmidt M, Nanka O, Foltan R, Kawaciuk I. Gender reassignment surgery in male-to-female transsexualism: a retrospective 3-month follow-up study with anatomical remarks. *J Sex Med* 2009; **6**: 1635–44.
- 63 Bocking WO, Rosser BR, Scheltema K. Transgender HIV prevention: implementation and evaluation of a workshop. *Health Educ Res* 1999; **14**: 177–83.
- 64 Bocking WO, Robinson BE, Forberg J, Scheltema K. Evaluation of a sexual health approach to reducing HIV/STD risk in the transgender community. *AIDS Care* 2005; **17**: 289–303.
- 65 Nemoto T, Operario D, Keatley J, Nguyen H, Sugano E. Promoting health for transgender women: Transgender Resources and Neighborhood Space (TRANS) program in San Francisco. *Am J Public Health* 2005; **95**: 382–84.
- 66 Zaza S, Wright-De Agüero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. Task Force on Community Preventive Services. *Am J Prev Med* 2000; **18** (suppl 1): 44–74.
- 67 Lipsitz MC, Segura ER, Castro JL, et al. Bringing testing to the people—benefits of mobile unit HIV/syphilis testing in Lima, Peru, 2007–2009. *Int J STD AIDS* 2014; **25**: 325–31.
- 68 Longfield K, Panyanouvong X, Chen J, Kays MB. Increasing safer sexual behavior among Lao kathoey through an integrated social marketing approach. *BMC Public Health* 2011; **11**: 872.
- 69 Pawa D, Firestone R, Ratchasi S, et al. Reducing HIV risk among transgender women in Thailand: a quasi-experimental evaluation of the sisters program. *PLoS One* 2013; **8**: e77113.
- 70 Taylor RD, Bimbi DS, Joseph HA, Margolis AD, Parsons JT. Girlfriends: evaluation of an HIV-risk reduction intervention for adult transgender women. *AIDS Educat Prevention* 2011; **23**: 469–78.
- 71 BMGF. Breaking through barriers: Avahan's scale-up of HIV prevention among high-risk MSM and transgenders in India. New Delhi: Bill & Melinda Gates Foundation, 2010.
- 72 Goswami P, Rachakulla HK, Ramakrishnan L, et al. An assessment of a large-scale HIV prevention programme for high-risk men who have sex with men and transgenders in Andhra Pradesh, India: using data from routine programme monitoring and repeated cross-sectional surveys. *BMJ Open* 2013; **3**: e002183.
- 73 Subramanian T, Ramakrishnan L, Aridoss S, et al. Increasing condom use and declining STI prevalence in high-risk MSM and TGs: evaluation of a large-scale prevention program in Tamil Nadu, India. *BMC Public Health* 2013; **13**: 857.
- 74 Gutierrez-Mock L, Thomas-Guess Y, Keatley J, Cotten P, Kegeles S. T-SISTA: a resource guide for adapting SISTA for transwomen of color. San Francisco: University of California San Francisco: The Transitions Project, 2009.
- 75 Molano LF, Barucco R. Transgender family program: integrated and holistic care as HIV prevention strategy for transgender people. Washington, DC: 19th International AIDS Conference, 2012.
- 76 Grant RM, McMahan V, Liu AY, et al. Completed observation of the randomized placebo-controlled phase of iPrEx: daily oral FTC/TDF pre-exposure HIV prophylaxis among men and trans women who have sex with men. 6th IAS Conference on HIV Pathogenesis, Treatment and Prevention, Rome, Italy, 2011.
- 77 Dunham E. LifeSkills: HIV prevention intervention with young transgender women. Philadelphia Trans-Health Conference, Philadelphia, PA, 2012.
- 78 Melendez RM, Exner TA, Ehrhardt AA, et al. Health and health care among male-to-female transgender persons who are HIV positive. *Am J Public Health* 2006; **96**: 1034–37.
- 79 Sevelius JM, Carrico A, Johnson MO. Antiretroviral therapy adherence among transgender women living with HIV. *J Assoc Nurses AIDS Care* 2010; **21**: 256–64.
- 80 Beattie TSH, Bhattacharjee P, Suresh M, Isac S, Ramesh BM, Moses S. Personal, interpersonal and structural challenges to accessing HIV testing, treatment and care services among female sex workers, men who have sex with men and transgenders in Karnataka state, South India. *J Epidemiol Commun Health* 2012; **66** (suppl 2): i42–48.

- 81 Sevelius JM, Patouhas E, Keatley JG, Johnson MO. Barriers and facilitators to engagement and retention in care among transgender women living with human immunodeficiency virus. *Ann Behav Med* 2014; **47**: 5–16.
- 82 Crago A-L. Female, male and transgender sex workers' perspectives on HIV and STI prevention and treatment services. A Global Civil Society Consultation, 2011.
- 83 Yehia BR, Fleishman JA, Moore RD, Gebo KA. Retention in care and health outcomes of transgender persons living with HIV. *Clin Infect Dis* 2013; **57**: 774–76.
- 84 Melendez RM, Pinto R. 'It's really a hard life': love, gender and HIV risk among male-to-female transgender persons. *Cult Health Sex* 2007; **9**: 233–45.
- 85 Gertler P, Shah M, Bertozzi Stefano M. Risky business: the market for unprotected commercial sex. *J Political Econ* 2005; **113**: 518–50.
- 86 Decker MR, Wirtz AL, Pretorius C, et al. Estimating the impact of reducing violence against female sex workers on HIV epidemics in Kenya and Ukraine: a policy modeling exercise. *Am J Reprod Immunol* 2013; **69** (suppl 1): 122–32.
- 87 Operario D, Nemoto T. HIV in transgender communities: syndemic dynamics and a need for multicomponent interventions. *J Acquir Immune Defic Syndr* 2010; **55** (suppl 2): S91–93.
- 88 Brennan J, Kuhns LM, Johnson AK, et al. Syndemic theory and HIV-related risk among young transgender women: the role of multiple, co-occurring health problems and social marginalization. *Am J Public Health* 2012; **102**: 1751–57.
- 89 Goswami P, Rachakulla HK, Ramakrishnan L, et al. An assessment of a large-scale HIV prevention programme for high-risk men who have sex with men and transgenders in Andhra Pradesh, India: using data from routine programme monitoring and repeated cross-sectional surveys. *BMJ Open* 2013; **3**: e002183.
- 90 Erasquin JT, Reed E, Blankenship KM. Police-related experiences and HIV risk among female sex workers in Andhra Pradesh, India. *J Infect Dis* 2011; **204** (suppl 5): S1223–28.
- 91 TVT. Transrespect vs transphobia. November 2012. <http://www.transrespect-transphobia.org/en/tvt-project/tmm-results/march-2013.htm> (accessed Feb 23, 2013).
- 92 Grant RM, Lama JR, Anderson PL, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *New Engl J Med* 2010; **363**: 2587–99.
- 93 Gomez GB, Borquez A, Case KK, Wheelock A, Vassall A, Hankins C. The cost and impact of scaling up pre-exposure prophylaxis for HIV prevention: a systematic review of cost-effectiveness modelling studies. *PLoS Med* 2013; **10**: e1001401.
- 94 Gomez GB, Borquez A, Caceres CF, et al. The potential impact of pre-exposure prophylaxis for HIV prevention among men who have sex with men and transwomen in Lima, Peru: a mathematical modelling study. *PLoS Med* 2012; **9**: e1001323.
- 95 Peinado J, Lama JR, Galea JT, et al. Acceptability of oral versus rectal HIV preexposure prophylaxis among men who have sex with men and transgender women in Peru. *J Int Assoc Provid AIDS Care* 2013; **12**: 278–83.
- 96 Yang D, Chariyalertsak C, Wongthanee A, et al. Acceptability of pre-exposure prophylaxis among men who have sex with men and transgender women in Northern Thailand. *PLoS One* 2013; **8**: e76650.
- 97 Coulter RWS, Kenst KS, Bowen DJ, Scout. Research funded by the National Institutes of Health on the health of lesbian, gay, bisexual, and transgender populations. *Am J Public Health* 2013; **104**: e105–12.
- 98 Bauer GR, Hammond R, Travers R, Kaay M, Hohenadel KM, Boyce M. "I don't think this is theoretical; this is our lives": how erasure impacts health care for transgender people. *J Assoc Nurses AIDS Care* 2009; **20**: 348–61.